

Appln No. 10/567,882
Amdt date November 24, 2009
Reply to Office action of August 24, 2009

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (Currently Amended) An adjustable mechanism for a motor vehicle for adjusting any one of an adjustable part in a motor vehicle and a seat part comprising:

a spindle nut defining an axis and interacting with a threaded spindle and comprising in an external surface an external toothing through which the spindle nut engages with a further gearing element;

wherein the external toothing of the spindle nut is formed through radially inwardly pointing indentations in the external surface of the spindle nut such that a crest of each tooth is defined by a portion of the external surface of the spindle nut, and wherein tooth depth diminishes towards at least one axial end of the spindle nut;

wherein the spindle nut has an opening with an internal surface, said internal surface comprising an internal toothing through which the spindle nut interacts with the threaded spindle;

wherein the spindle nut has in the axial direction on at least one side of the external toothing an end section without external toothing, and wherein an outer diameter of the crest is less than or equal to an outer diameter of the end section; and

wherein the internal toothing of the spindle nut interacting with the threaded spindle extends over a greater length in the axial direction than the external toothing of the spindle nut so that the internal toothing extends axially into the at least one end section without external toothing.

2. (Previously Presented) The adjustable mechanism according to claim 1, wherein the tooth depth of the external toothing decreases to zero towards at least one axial end of the spindle nut.

3. (Previously Presented) The adjustable mechanism according to claim 1, wherein the external tothing of the spindle nut extends in the axial direction only over a part of the axial extension of the outer surface of the spindle nut so that the spindle nut has in the axial direction on the other side of the external tothing at least one end section without external tothing.

4. (Previously Presented) The adjustable mechanism according to claim 3, wherein the at least one axial end section of the spindle nut without external tothing is formed substantially as a circular line.

5. (Previously Presented) The adjustable mechanism according to claim 1, wherein the external tothing of the spindle nut is formed by indentations in the external surface of the spindle nut in relation to at least one end section of the spindle nut.

6. (Canceled)

7. (Previously Presented) The adjustable mechanism according to claim 3, wherein the spindle nut has an external surface in the form of a cylinder sleeve and that the external tothing is formed by indentations in the external surface whereby the diameter of the at least one end section is larger than or equal to the diameter of the external surface which is provided with indentations.

8. (Previously Presented) The adjustable mechanism according to claim 3, wherein the spindle nut in the region of the external tothing does not project in the radial direction beyond the at least one end section.

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9. (Previously Presented) The adjustable mechanism according to claim 1, wherein the external toothing is globoid in shape and more particularly has globoid toothing in its axial edge regions.

10. (Previously Presented) The adjustable mechanism according to claim 1, wherein the external toothing has an involute profile in a middle section in the axial direction.

11. (Previously Presented) The adjustable mechanism according to claim 1, wherein the spindle nut is made of plastics.

12. (Previously Presented) The adjustable mechanism according to claim 1, wherein the further gearing element comprises a worm gear and wherein external toothing of the spindle nut interacts with the worm gear.

13. (Canceled)

14. (Previously Presented) The adjustable mechanism according to claim 1, wherein tooth thickness of the internal toothing of the spindle nut interacting with the threaded spindle is greater than a gap between each tooth.

15. (Previously Presented) The adjustable mechanism according to claim 1, wherein the spindle nut and the further gearing element are mounted in a gearbox housing.

16. (Previously Presented) The adjustable mechanism according to claim 15, wherein the gearbox housing is formed by housing parts.

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17. (Previously Presented) The adjustable mechanism according to claim 16, wherein the housing parts are connected to one another through push-fit connections and are aligned relative to each other along all spatial directions.

18. (Previously Presented) The adjustable mechanism according to claim 16, wherein the gearbox housing comprises one or two pairs of opposing housing parts.

19. (Previously Presented) The adjustable mechanism according to claim 16, wherein the gearbox housing comprises two external housing parts which have a U-shaped cross-section.

20. (Previously Presented) The adjustable mechanism according to claim 19, wherein the external housing parts engage round bearing parts mounted opposite one another in the axial direction to support the spindle nut.

21. (Previously Presented) The adjustable mechanism according to claim 20, wherein the external housing parts surround bearing sections of the bearing parts.

22. (Previously Presented) The adjustable mechanism according to claim 15, wherein the gearbox housing is comprised of plastics.

23. (Previously Presented) The adjustable mechanism according to claim 15, wherein the gearbox housing has bearing points for one of the spindle nut and the further gearing element.

24. (Previously Presented) The adjustable mechanism according to claim 1, wherein a bearing collar for supporting the spindle nut protrudes from the axial end sections of the spindle nut.

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25. (Previously Presented) The adjustable mechanism according to claim 6, wherein the end sections further define bearings for supporting the spindle nut whereby the axial and radial bearing is produced through a pair of housing parts of a gearbox housing.

26. (Previously Presented) The adjustable mechanism according to claim 15, wherein the gearbox housing has in at least one boundary wall a recess in which one of the spindle nut and further gearing element radially engages.

27. (Previously Presented) The adjustable mechanism according to claim 26, wherein the recess is defined by an opening in the corresponding boundary wall.

28. (Canceled)

29. (Previously Presented) The adjustable mechanism according to claim 26, wherein in the gearbox housing are formed two recesses set opposite one another across the axis of the spindle nut for the spindle nut.

30. (Previously Presented) The adjustable mechanism according to claim 26, wherein in a boundary wall of the gearbox housing a recess is formed for the side of the further gearing element remote from the spindle nut.

31. (Previously Presented) The adjustable mechanism according to claim 15, wherein between the gearbox housing and an associated holder of the gearbox housing there is at least one element for acoustic uncoupling.

32. (Previously Presented) The adjustable mechanism according to claim 31, wherein the at least one element is injection moulded.

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33. (Canceled)

34. (Previously Presented) The adjustable mechanism according to claim 16, wherein the housing parts are connected to one another through laser welding.

35. (Previously Presented) The adjustable mechanism according to claim 34, wherein the gearbox housing has internal housing parts and external housing parts whereby the material of the external housing parts is transparent for the laser beam used for welding, and the material of the internal housing parts is designed non-transparent for the laser beam used so that a connection with the external housing parts is producible through partial melting of the internal housing parts.

36. (Previously Presented) The adjustable mechanism according to claim 20, wherein at least the spindle nut and the bearing plates of the gearbox housing are made together in one injection moulding tool.

37. (Previously Presented) The adjustable mechanism according to claim 1, wherein a gearbox housing is set in a holder of U-shaped cross-section by which it can be fixed against an associated adjustable part.

38. (Withdrawn) A method for manufacturing an adjustable mechanism with the features of claim 1, wherein the spindle nut and the gearing element are mounted in a gearbox housing comprising two external housing parts;

wherein the external housing parts engage round bearing parts mounted opposite one another in the axial direction to support the spindle nut; and

wherein the spindle nut and the bearing parts are made together in one injection moulding tool in a multi-stage injection moulding process.

39. (Withdrawn) The method according to claim 38, wherein the spindle nut and the bearing parts are made in the injection moulding tool one after the other through injection moulding whereby each of the previously made structural assembly units remains in the injection moulding tool while the next assembly unit to be made is injected.

40. (Withdrawn) The method according to claim 38, wherein further parts of the gearbox housing are made in the injection moulding tool while the previously made structural assemblies remain in the injection moulding tool.

41. (Withdrawn) The method according to claim 38, wherein external U-shaped housing parts of the gearbox housing are made in the injection moulding tool.

42. (Withdrawn) The method according to claim 38, wherein the further gear element is inserted in the injection moulding tool before the parts of the gearbox housing which are provided for supporting the further gear element are made by injection moulding.

43. (Withdrawn) The method for manufacturing an adjustable mechanism with the features of claim 34, wherein the gearbox housing comprises two external housing parts engaging round bearing parts mounted opposite one another in the axial direction to support the spindle nut, and

wherein the spindle nut and the bearing parts are made together in one injection moulding tool in a multi-stage injection moulding process, and wherein before or during the connection of the housing parts by laser welding any axial bearing play between the inner housing parts of the gearbox housing and the spindle nut is removed.

44. (Withdrawn) The method according to claim 43, wherein the axial bearing play is removed by:

a) applying a defined axial force to internal housing parts;

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b) melting regions of the internal housing parts which are enclosed by areas of push-fit connection of the external housing parts; and

c) terminating the laser welding when the at least one end section of the spindle nut bears against the gearbox housing.

45. (Withdrawn) The method for mounting an adjustable mechanism mounted in a gearbox housing for a motor vehicle wherein at least one housing part is brought into engagement with a further housing assembly unit and the housing part is fixed against the further housing assembly unit in that material is melted in the engagement area of the housing part with the housing assembly, more particularly to assemble an adjustable mechanism according to claim 1, wherein the housing part and the further housing assembly are tensioned elastically against one another during the melting.

46. (Withdrawn) The method according to claim 45, wherein a tension device engages on one of the housing part and the further housing assembly unit in order to tension the housing part and the further housing assembly unit relative to one another.

47. (Withdrawn) The method according to claim 46, wherein the tension device engages on the associated element of the housing with the interposition of an elastic element.

48. (Withdrawn) The method according to claim 47, wherein a compression spring is used as the elastic element.

49. (Withdrawn) The method according to claim 45, wherein the housing part and the further housing assembly unit are brought into engagement with one another along an installation axis.

50. (Withdrawn) The method according to claim 49, wherein the engagement area is formed by a push-in area and the housing part and the further housing assembly unit are brought into engagement with one another by fitting one in the other.

51. (Withdrawn) The method according to claim 49, wherein the housing part and the further housing assembly unit are tensioned against one another along the installation axis.

52. (Withdrawn) The method according to claim 49, wherein the housing part and the further housing assembly unit are tensioned relative to one another in a direction which has a direction component transversely to the installation axis.

53. (Withdrawn) The method according to claim 52, wherein the housing part and the further housing assembly unit are tensioned relative to one another perpendicular to the installation axis.

54. (Withdrawn) The method according to claim 45, wherein the further housing assembly unit comprises a second housing part.

55. (Withdrawn) The method according to claim 54, wherein the two housing parts are fixed directly one against the other.

56. (Withdrawn) The method according to claim 45, wherein the further housing assembly unit is housed between the housing part and a second housing part whereby the two housing parts are each brought into engagement with one end side of the further housing assembly unit and are fixed against the associated end side and wherein material of one of the further housing part and of the housing assembly unit is fused in the engagement area of the relevant housing part with the associated end side of the further housing assembly unit.

57. (Withdrawn) The method according to claim 56, wherein the two housing parts are tensioned relative to each other whereby at least one of the two housing parts is also tensioned relative to the further housing assembly unit.

58. (Withdrawn) The method according to claim 46, wherein the two housing parts are tensioned against one another along the installation axis.

59. (Withdrawn) The method according to claim 46, wherein the two housing parts are tensioned against one another along the installation axis and wherein the two housing parts are tensioned relative to one another along a direction which has a direction component perpendicular to the installation axis.

60. (Withdrawn) The method according to claim 59, wherein the two housing parts are tensioned relative to each other along a direction extended perpendicular to the installation axis.

61. (Withdrawn) The method according to claim 50, wherein the further housing assembly unit is formed by two housing elements which are opposite one another perpendicular to the two housing parts.

62. (Withdrawn) The method according to claim 45, wherein a housing plate is used for the at least one housing part.

63. (Withdrawn) The method according to claim 45, wherein during melting of the material in the engagement area, the at least one housing part executes a settling movement relative to the further housing assembly unit.

64. (Withdrawn) The method according to claim 63, wherein the settling movement takes place in the direction of the elastic pretension.

65. (Withdrawn) The method according to claim 45, wherein the material is melted in the engagement area by a laser.

66. (Withdrawn) The method according to claim 65, wherein non-melting areas of the housing are made from material which is permeable to the laser beam used.

67. (Withdrawn) The method according to claim 45, wherein the duration of the melting process is controlled from a predeterminable criterion.

68. (Withdrawn) The method according to claim 63, wherein the duration of the melting process is controlled from a predeterminable criterion, and wherein the duration of the melting process is controlled in dependence on the settling movement of the at least one housing part.

69. (Withdrawn) The method according to claim 68, wherein the duration of the melting process is controlled in dependence on one of the speed and the dynamics of the settling movement.

70. (Withdrawn) The method according to claim 67, wherein the duration of the melting process is controlled in dependence on the change in the reaction force during tensioning of the at least one housing part relative to the further housing assembly unit.

71. (Withdrawn) The method according to claim 68, wherein the duration of the melting process is controlled in dependence on the extent of the settling movement.

72. (Withdrawn) The method according to claim 67, wherein the duration of the melting process is already fixed at the start of the melting process.

73. (Withdrawn) The method according to claim 45, wherein in the engagement area of the at least one housing part with the further housing assembly unit is a clearance into which flows the melted mass formed by the melting of the material.

74. (Withdrawn) The method according to claim 73, wherein the clearance is formed in the areas of push-fit connection.

75. (Withdrawn) The method according to claim 45, wherein the quality of the connection between the at least one housing part and the further housing assembly unit is monitored during the melting process from the extent of the movement of the housing part relative to the further housing assembly unit.

76. (Withdrawn) The method according to claim 63, wherein the material is melted in the engagement area by a laser, wherein the quality of the connection between the at least one housing part and the further housing assembly unit is monitored during the melting process from the extent of the movement of the housing part relative to the further housing assembly unit, and wherein the laser power is regulated in dependence on the speed of the settling movement.

77. (Withdrawn) The method according to claim 45, wherein the at least one housing part and the further housing assembly unit are made of plastics.

78. (Withdrawn) A method for manufacturing an adjustable mechanism with the features of claim 20, wherein the spindle nut and the bearing parts are made together in one injection moulding tool in a multi-stage injection moulding process.

79. (Withdrawn) A method for manufacturing an adjustable mechanism with the features of claim 22, wherein the spindle nut and the bearing parts are made together in one injection moulding tool in a multi-stage injection moulding process.

80. (Withdrawn) The method according to claim 57, wherein the two housing parts are tensioned against one another along the installation axis.

81. (Withdrawn) The method according to claim 46, wherein the two housing parts are tensioned relative to each other whereby at least one of the two housing parts is also tensioned relative to the further housing assembly unit and wherein the two housing parts are tensioned relative to one another along a direction which has a direction component perpendicular to the installation axis.

82. (Previously Presented) The adjustable mechanism according to claim 7, wherein the spindle nut has in the axial direction on either side of the external toothing an end section without external toothing, and wherein the end sections serve at the same time as bearings for supporting the spindle nut whereby the axial and radial bearing is produced through a pair of housing parts of a gearbox housing.

83. (Previously Presented) The adjustable mechanism according to claim 16, wherein the housing parts are in the form of housing plates.

84. (Previously Presented) The adjustable mechanism according to claim 23, wherein the bearing points are in the form of bearing openings.

85. (Previously Presented) The adjustable mechanism according to claim 31, wherein the at least one element is formed as a resilient member.

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86. (Previously Presented) The adjustable mechanism according to claim 32, wherein the at least one element is injection moulded in one-piece on the gear housing.

87. (Previously Presented) The adjustable mechanism according to claim 1, wherein a reinforcement ring is mounted on a bearing collar of the spindle nut.